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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	082771.P259
First Inventor or Application Identifier	James V. Luciani
Title	METHOD FOR IMPROVING SIGNALING EFFICIENCY AND
Express Mail Label No.	EL034432708US

APPLICATION ELEMENTS
See MPEP chapter 600 concerning utility patent application contents

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1. ☒ Fee Transmittal Form
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2. ☒ Specification [Total Pages 25]
(preferred arrangement set forth below)
   - Descriptive title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to Microfiche Appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings *(if filed)*
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
3. ☒ Drawing(s) *(35 U.S.C. 113)* [Total Sheets 3]
4. Oath or Declaration [Total Pages 2]
   a. ☒ Newly executed (original copy)
   b. ☐ Copy from a prior application (37 C.F.R. § 1.63(d)) *(for continuation/divisional with Box 16 completed)*
      i. ☐ DELETION OF INVENTOR(S)
      Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR §§ 1.63(d)(2) and 1.33(b).

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5. ☐ Microfiche Computer Program *(Appendix)*
6. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
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ACCOMPANYING APPLICATION PARTS

7. ☒ Assignment Papers (cover sheet & document(s))
8. ☐ 37 C.F.R. § 3.73(b) Statement *(when there is an assignee)* ☐ Power of Attorney
9. ☐ English Translation Document *(if applicable)*
10. ☐ Information Disclosure Statement (IDS)/PTO - 1449 ☐ Copies of IDS Citations
11. ☐ Preliminary Amendment
12. ☒ Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
13. ☐ *Small Entity Statement(s) ☐ Statement filed in prior application, Status still proper and desired
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Attorney Docket No.: 82771.P259 Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

TITLE OF THE INVENTION

METHOD FOR IMPROVING SIGNALING EFFICIENCY AND PERFORMING SERVICE LOAD BALANCING IN A CONNECTION ORIENTED NETWORK

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BACKGROUND OF THE INVENTION

Field of the Invention

The present invention is related to data communications. In particular, the present invention is related to a method for resolving a request for information in a multiprotocol internetwork environment operating over Non-Broadcast Multiple Access (NBMA) subnetworks.

Description of the Related Art

The Next Hop Resolution Protocol (NHRP) is described in Luciani, J., Katz, D., Piscitello, D., Cole, B., and Doraswamy, N., "NBMA Next Hop Resolution Protocol (NHRP)", IETF RFC 2332, April, 1998. With reference to Fig. 1, the NHRP allows a source station 110 (a node, host, switch, router, etc.) in a multiprotocol internetwork 100 to communicate with a destination station 130 over a Non-Broadcast, Multiple Access (NBMA) subnetwork 105. The NHRP provides source station 110 with the capability to determine the NBMA address of

the NBMA next hop toward the destination station, through the exchange of NHRP resolution requests and resolution replies. As pointed out in RFC 2332, the NBMA subnetwork may be non-broadcast because it does not support broadcasting (e.g., an X.25 or ATM subnetwork) or broadcasting is not possible, for example, in the case of a Local Area Network (LAN) that supports a large number of stations. In Fig. 1, the NBMA next hop toward the destination station is router 120 since it is the closest router to destination station 130 and provides egress from the NBMA subnetwork. It should be noted that terms used herein to describe the present invention, such as internetwork layer, server, client, and station, are to be interpreted in a manner consistent with the definition and use of such terms as provided in RFC 2332.

In accordance with the NHRP, Next Hop Servers (NHSs) are provided in the NBMA subnetwork which are capable of responding to NHRP resolution requests. In Fig. 1, egress router 125 also functions as a NHS, and serves one or more destination stations, such as destination station 130. Likewise, ingress router 115 must function as a NHS for station 110.

An NHS builds and maintains a data structure that contains internetwork layer address (e.g., an Internet Protocol address) to NBMA subnetwork layer address resolution information. The table may be built and managed in accordance with techniques known to those of ordinary skill in the related arts. For example, a station may send a NHRP registration request to a NHS serving the station. The NHRP registration request contains internetwork layer address to

NBMA subnetwork layer address resolution information that is then stored in the table maintained by the NHS.

A station that is a client of the NHRP service is known as a NHRP Client, or simply NHC. The NHS with which a NHC communicates to provide NBMA next hop information is the serving NHS for the NHC. In Fig. 1, NHS 115 serves station (NHC) 110, and NHS 125 serves station (NHC) 130 in most cases. For a serving NHS to supply address resolution information to a NHC, a continuous link of NHSs must exist along a path in the NBMA subnetwork between the NHC making the NHRP resolution request and the destination NHC, e.g., NHSs 115, 120 and 125. In accordance with RFC 2332, the last NHS along the path within the NBMA subnetwork is the serving NHS. That is, NHRP resolution requests are not forwarded to destination station/NHCs but are processed by the serving NHS. However, each NHC also maintains a table of internetwork layer address to NBMA address resolution information that it obtains from NHRP resolution replies, manual configuration, or through mechanisms outside the scope of the NHRP. Destination NHCs may be constrained on resource (e.g., SAR VPI/VCIs), and there is no existing mechanism to communicate that fact to the serving NHS which would normally reply to a resolution request on behalf of the NHC. Thus, the only way that a source station would find that out would be to attempt a connection setup and fail which is time consuming and resource intensive. By allowing the destination NHC to reply for itself, since it is in the best situation to know whether it has resource enough for the connection, signaling efficiency is

gained since no additional connection setup attempt will be tried by the source station. Moreover, in the situation where multiple NHCs register with a given serving NHS for the same set of NBMA subnetwork addresses (e.g., for the same set of ATM attached servers/services), the NHS may perform service load balancing by forwarding the resolution request to a particular NHC and if that NHC then NAKs the resolution request, the serving NHS may offer the request to another NHC which is not currently busy. Further the NHS may choose to offer the request in some scheduled fashion (e.g., round robing) to each of the appropriate NHCs in turn.

BRIEF SUMMARY OF THE INVENTION

A method is described for forwarding NHRP resolution requests directly to an NHC so that the NHC itself may respond to the NHRP resolution request with a NHRP resolution reply, rather than having the serving NHS reply to the resolution request on behalf of the NHC.

BRIEF SUMMARY OF THE SEVERAL VIEWS OF THE DRAWINGS

The present invention is illustrated by way of example and not limitation in the following figures, in which:

Figure 1 is a prior art diagram of a multiprotocol internetwork environment operating over an NBMA subnetwork.

Figure 2 illustrates an embodiment of the present invention.

Figure 3 illustrates a multiprotocol internetwork environment in which an embodiment of the present invention may be utilized.

DETAILED DESCRIPTION OF THE INVENTION

Described is a method providing for a NHC to respond to a NHRP resolution request. In the following description, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be apparent, however, to one of ordinary skill in the art that the present invention may be practiced without these specific details. In other instances, well-known architectures, steps, and techniques have not been shown to avoid unnecessarily obscuring the present invention.

With reference to Fig. 2, an embodiment of the present invention 200 proceeds as follows. The process starts as 205, wherein source station 110, given the internetwork layer address of destination station 130, seeks to resolve the NBMA subnetwork address of a path to station 130. At 210, if the NBMA subnetwork address information for the path to station 130 is already available in the address resolution table maintained at the source station, then that information is utilized by the source station in communicating with station 130 and the resolution process is done at 215. Otherwise, the source station creates at 220 a NHRP resolution request packet comprising the internetwork layer address of the destination station as the destination address, the internetwork layer address of the source station as the source address, and the NBMA subnetwork address information for the source station. Source station 110 then transmits the NHRP resolution request packet at 225 to the nearest NHS (i.e., ingress router 115) along

the routed path of NHSs within the NBMA subnetwork 105, toward the destination station 130.

The NHS 115 receives the NHRP resolution request at 230, examines at 235 whether it serves destination station 130, and if not, forwards the resolution request at 225 to the next NHS in the routed path to destination station 130, in this case, intermediate NHS 120.

The process continues in this manner until NHS 125 receives and examines the destination internetwork address in the resolution request packet and determines at 235 that it serves destination station 130. NHS 125 then considers at 240 whether it should respond to the NHRP resolution request on behalf of its NHS, destination station 130, or whether it should forward the resolution request on to the destination station so that the destination station may respond directly to the resolution request. If the serving NHS determines it should reply to the resolution request on behalf of its NHC, destination station 130, then the serving NHS formulates, and transmits at 260, a positive NHRP resolution reply that resolves the NBMA address information for destination station 130 on the destination station's behalf. The NHRP resolution reply packet contains the address resolution information for the destination station and is sent back to the source station. It should be noted that if the destination station is not on the NBMA subnetwork, as is the case in multiprotocol internetwork 100, the next hop subnetwork layer address will be that of the egress router 125 through which packets addressed to the destination station are forwarded.

In determining at 240 whether the serving NHS or the NHC/destination station should respond to a NHRP resolution request, in one embodiment of the present invention, a destination station may inform its serving NHS that it wishes to directly reply to NHRP resolution requests received at the serving NHS from another station. One manner in which the NHC may inform the serving NHS of its wish to directly reply to NHRP resolution requests is to indicate via a unique time/length/value (TLV) extension to a NHRP registration request packet that it wishes to receive and respond to any NHRP resolution requests that the serving NHS receives, rather than allowing the serving NHS to respond to the resolution request on behalf of the NHC/destination station.

In another embodiment, different TLV values may be specified in a NHRP registration request sent from the NHC to the NHS to indicate certain situations under which it is applicable for or desired that the NHS forward NHRP resolution requests to the NHC. For example, the NHC may specify via the TLV extension part of a NHRP registration request packet certain resource constraints on the NHS during which time the NHS is to forward NHRP resolution requests about the NHC to the NHC rather than responding to the request on behalf of the NHC. Alternatively, a NHC may choose whether to reject or accept a NHRP resolution request forwarded to it from its serving NHS based on an agreed upon configuration, e.g., through manual (user) configuration, management signaling, etc, or via information obtained by another protocol, for example, via a routing

protocol. Under these approaches, communication of such configuration via the TLV extension in a NHRP registration request packet is not necessary.

With respect to Fig. 3, in yet another embodiment of the present invention, when multiple NHCs, e.g., stations 130, 140 and 150, transmit NHRP registration requests to the serving NHS 125 to register for the same destination address or set of destination addresses (e.g., for the same set of ATM attached servers/services), the NHS may perform load balancing by directing a NHRP resolution request to a certain one or more of the NHCs. The choice of which one or more of the NHCs to offer the request to and in what manner is a local matter. An appropriate NHC may be selected according to any one of a number of means. For example, a round robin, weighted round robin, or some other arbitration scheme may be employed to select the appropriate NHC to receive the NHRP resolution request. Moreover, the NHC selected may decide to accept or reject the NHRP resolution request based on certain criteria, such as resource availability, source address of the source station, or any other well known packet filtering technique. This approach often is advantageous given that a particular NHC generally is in a better position to determine if it is willing to receive communications from a source station than its serving NHS.

In the embodiment illustrated in Fig. 3, if a given NHC has indicated to its serving NHS that is capable of receiving and responding directly to a NHRP resolution request , but nevertheless decides to reject a NHRP resolution request, then the serving NHS, upon receiving a negative NHRP resolution reply from the

NHC, may elect to forward the NHRP resolution request on to another NHC that satisfies the request criteria. In this way, an improved load balancing capability and better set up connection signaling efficiency is achieved.

CLAIMS

What is claimed is:

1. A method for communicating information in a network, comprising:

a) sending a request for information about a destination node from a source node to a server node that responds to such requests on behalf of the destination node;

b) forwarding the request from the server node to the destination node;

c) sending a response to the request from the destination node to the server node; and

d) forwarding the response from the server node to the source node.

2. The method of claim 1, wherein sending a request for information about a destination node from a source node to a server node that responds to such requests on behalf of the destination node comprises sending an Next Hop Resolution Protocol (NHRP) resolution request from a NHRP capable source node to a NHRP server node that responds to such requests on behalf of the destination node.

3. The method of claim 2, wherein forwarding the request from the server node to the destination node comprises forwarding the NHRP resolution request from the NHRP server node to the destination node.

4. The method of claim 3, wherein sending a response to the request from the destination node to the server node comprises sending a NHRP resolution reply to the NHRP resolution request from the destination node to the NHRP server node.

5. The method of claim 4, wherein forwarding the response from the server node to the source node comprises forwarding the NHRP resolution reply from the NHRP server node to the NHRP capable source node.

6. A method for communicating internetwork layer address to subnetwork layer address resolution information between peer stations in a nonbroadcast, multiple access subnetwork, comprising:

a) generating at a source station a next hop resolution protocol (NHRP) resolution request to obtain internetwork layer address to subnetwork layer address resolution information for a destination station, the NHRP resolution request specifying the internetwork layer address for the destination station;

b) transmitting the NHRP resolution request to a next hop resolution protocol server (NHS) within the nonbroadcast multiple access subnetwork that serves the destination station;

c) determining at the NHS to forward the NHRP resolution request to the destination station;

d) generating at the destination station a NHRP resolution reply providing the internetwork layer address to NBMA subnetwork layer address resolution information;

e) transmitting the NHRP resolution reply from the destination station to the NHS; and

f) transmitting the NHRP resolution reply from the NHS to the source station.

7. The method of claim 6, wherein determining at the NHS to forward the NHRP resolution request to the destination station further comprises determining that the destination station previously transmitted a NHRP registration request to the NHS requesting the NHS to forward any NHRP resolution request that specified the internetwork layer address for the destination station to the destination station.

8. The method of claim 7, wherein determining that the destination station previously transmitted a NHRP registration request to the NHS requesting the NHS to forward any NHRP resolution request that specified the internetwork layer address for the destination station to the destination station further comprises determining that the destination station previously transmitted a NHRP registration request to the NHS, the NHRP registration request specifying a unique time/length/value (TLV) extension value that the NHS recognized as

requesting the NHS to forward any NHRP resolution request that specified the internetwork layer address for the destination station to the destination station.

9. The method of claim 6, wherein determining at the NHS to forward the NHRP resolution request to the destination station further comprises determining that the NHS was previously configured to request the NHS to forward any NHRP resolution request that specified the internetwork layer address for the destination station to the destination station.

10. The method of claim 6, wherein determining at the NHS to forward the NHRP resolution request to the destination station further comprises determining that the NHS previously received a communication via an internetworking protocol instructing the NHS to forward any NHRP resolution request that specified the internetwork layer address for the destination station to the destination station.

11. A method for communicating internetwork layer address to subnetwork layer address resolution information between peer stations in a nonbroadcast, multiple access subnetwork, comprising:

a) generating at a source station a next hop resolution protocol (NHRP) resolution request to obtain internetwork layer address to subnetwork layer

address resolution information for a destination station, the NHRP resolution request specifying the internetwork layer address for the destination station;

b) transmitting the NHRP resolution request to a next hop resolution protocol server (NHS) within the nonbroadcast multiple access subnetwork that serves the destination station;

c) determining at the NHS to forward the NHRP resolution request to the destination station;

d) determining at the destination station whether to receive or reject the NHRP resolution request forwarded from the NHS;

e) generating at the destination station a NHRP resolution reply providing the internetwork layer address to NBMA subnetwork layer address resolution information if the destination station determined to receive the NHRP resolution reqeuest forwarded from the NHS;

f) transmitting the NHRP resolution reply from the destination station to the NHS; and

g) transmitting the NHRP resolution reply from the NHS to the source station.

12. The method of claim 11, wherein determining at the destination station whether to receive or reject the NHRP resolution request forwarded from the NHS comprises determining at the destination station whether to receive or reject the

NHRP resolution request forwarded from the NHS based on management signaling.

13. The method of claim 11, wherein determining at the destination station whether to receive or reject the NHRP resolution request forwarded from the NHS comprises determining at the destination station whether to receive or reject the NHRP resolution request forwarded from the NHS based on user configuration.

14. An article of manufacture comprising a computer readable medium having computer readable program code means embodied thereon for communicating information in a network, comprising:

computer readable program code means for receiving a request for information about a destination node from a source node at a server node that responds to such requests on behalf of the destination node;

computer readable program code means for forwarding the request from the server node to the destination node;

computer readable program code means for receiving a response to the request from the destination node at the server node; and

computer readable program code means for forwarding the response from the server node to the source node.

15. An article of manufacture comprising a computer readable medium having computer readable program code means embodied thereon for communicating internetwork layer address to subnetwork layer address resolution information between peer stations in a nonbroadcast, multiple access subnetwork, comprising:

computer readable program code means at a next hop resolution protocol server (NHS) within the nonbroadcast multiple access subnetwork that serves a destination station, the computer readable program code means receiving a next hop resolution protocol (NHRP) resolution request from a source station to obtain internetwork layer address to subnetwork layer address resolution information for a destination station, the NHRP resolution request specifying the internetwork layer address for the destination station;

computer readable program code means for determining at the NHS to forward the NHRP resolution request to the destination station;

computer readable program code means at the NHS for receiving from the destination station a NHRP resolution reply providing the internetwork layer address to NBMA subnetwork layer address resolution information; and

computer readable program code means at the NHS for transmitting the NHRP resolution reply from the NHS to the source station.

16. A method for communicating internetwork layer address to subnetwork layer address resolution information in a nonbroadcast, multiple access subnetwork, comprising:

a) generating at a source station a next hop resolution protocol (NHRP) resolution request to obtain internetwork layer address to subnetwork layer address resolution information for a destination station, the NHRP resolution request specifying an internetwork layer address for the destination station;

b) transmitting the NHRP resolution request to a next hop resolution protocol server (NHS) within the nonbroadcast multiple access subnetwork that serves a plurality of destination stations sharing the internetwork layer address;

c) determining at the NHS to forward the NHRP resolution request to a one of the plurality of destination stations according to an arbitration scheme;

d) generating at the one of the plurality of destination stations a NHRP resolution reply providing the internetwork layer address to NBMA subnetwork layer address resolution information;

e) transmitting the NHRP resolution reply from the one of the plurality of destination stations to the NHS; and

f) transmitting the NHRP resolution reply from the NHS to the source station.

17. A method of communicating internetwork layer address to subnetwork layer address resolution information, comprising:

a) generating at a source station a next hop resolution protocol (NHRP) resolution request to obtain internetwork layer address to subnetwork layer

address resolution information for a destination station, the NHRP resolution request specifying an internetwork layer address for the destination station;

b) transmitting the NHRP resolution request to a next hop resolution protocol server (NHS) within the nonbroadcast multiple access subnetwork that serves a plurality of destination stations sharing the internetwork layer address;

c) determining at the NHS to forward the NHRP resolution request to one of the plurality of destination stations according to an arbitration scheme;

d) generating at the one of the plurality of destination stations one of: a NHRP resolution reply providing the internetwork layer address to NBMA subnetwork layer address resolution information; and a negative NHRP resolution reply that fails to provide the internetwork layer address to NBMA subnetwork layer address resolution information;

e) transmitting the NHRP resolution reply from the one of the plurality of destination stations to the NHS;

f) repeating c through e until one of: the NHRP resolution reply provides the internetwork layer address to NBMA subnetwork layer address resolution information; and the last of the one of the plurality of destination stations transmits the NHRP resolution reply to the NHS; and

f) transmitting the NHRP resolution reply from the NHS to the source station.

18. An article of manufacture comprising a computer readable medium having computer readable program code means embodied thereon for communicating internetwork layer address to subnetwork layer address resolution information, comprising:

computer readable program code means for generating at a source station a next hop resolution protocol (NHRP) resolution request to obtain internetwork layer address to subnetwork layer address resolution information for a destination station, the NHRP resolution request specifying an internetwork layer address for the destination station;

computer readable program code means for transmitting the NHRP resolution request to a next hop resolution protocol server (NHS) within the nonbroadcast multiple access subnetwork that serves a plurality of destination stations sharing the internetwork layer address;

computer readable program code means for determining at the NHS to forward the NHRP resolution request to a one of the plurality of destination stations according to an arbitration scheme;

computer readable program code means for generating at the one of the plurality of destination stations a NHRP resolution reply providing the internetwork layer address to NBMA subnetwork layer address resolution information;

computer readable program code means for transmitting the NHRP resolution reply from the one of the plurality of destination stations to the NHS; and

computer readable program code means for transmitting the NHRP resolution reply from the NHS to the source station.

19. A method for communicating information in a network, comprising:

a) receiving a request for information about a destination node from a source node at a server node that responds to such requests on behalf of the destination node;

b) forwarding the request from the server node to the destination node;

c) receiving a response to the request from the destination node at the server node; and

d) forwarding the response from the server node to the source node.

20. A method for communicating internetwork layer address to subnetwork layer address resolution information in a nonbroadcast, multiple access subnetwork, comprising:

a) receiving at a next hop resolution protocol server (NHS) a next hop resolution protocol (NHRP) resolution request that was generated and transmitted by a source station to obtain internetwork layer address to subnetwork layer address resolution information for a destination station that is served by the NHS, the NHRP resolution request specifying the internetwork layer address for the destination station;

b) determining at the NHS to forward the NHRP resolution request to the destination station;

c) receiving an NHRP resolution reply providing the internetwork layer address to NBMA subnetwork layer address resolution information generated and transmitted by the destination station to the NHS; and

d) transmitting the NHRP resolution reply from the NHS to the source station.

ABSTRACT OF THE DISCLOSURE

A method for improving signaling efficiency and load balancing in a non-broadcast, multiple access network environment. The standard next hop resolution protocol (NHRP) essentially is extended to provide peer to peer, i.e., source station to destination station, communication regarding resource availability and internetwork layer address to NBMA subnetwork layer address resolution, rather than client-server communication between a source station and a server that communicates with the source station on behalf of the destination station, as is the case in standard NHRP.

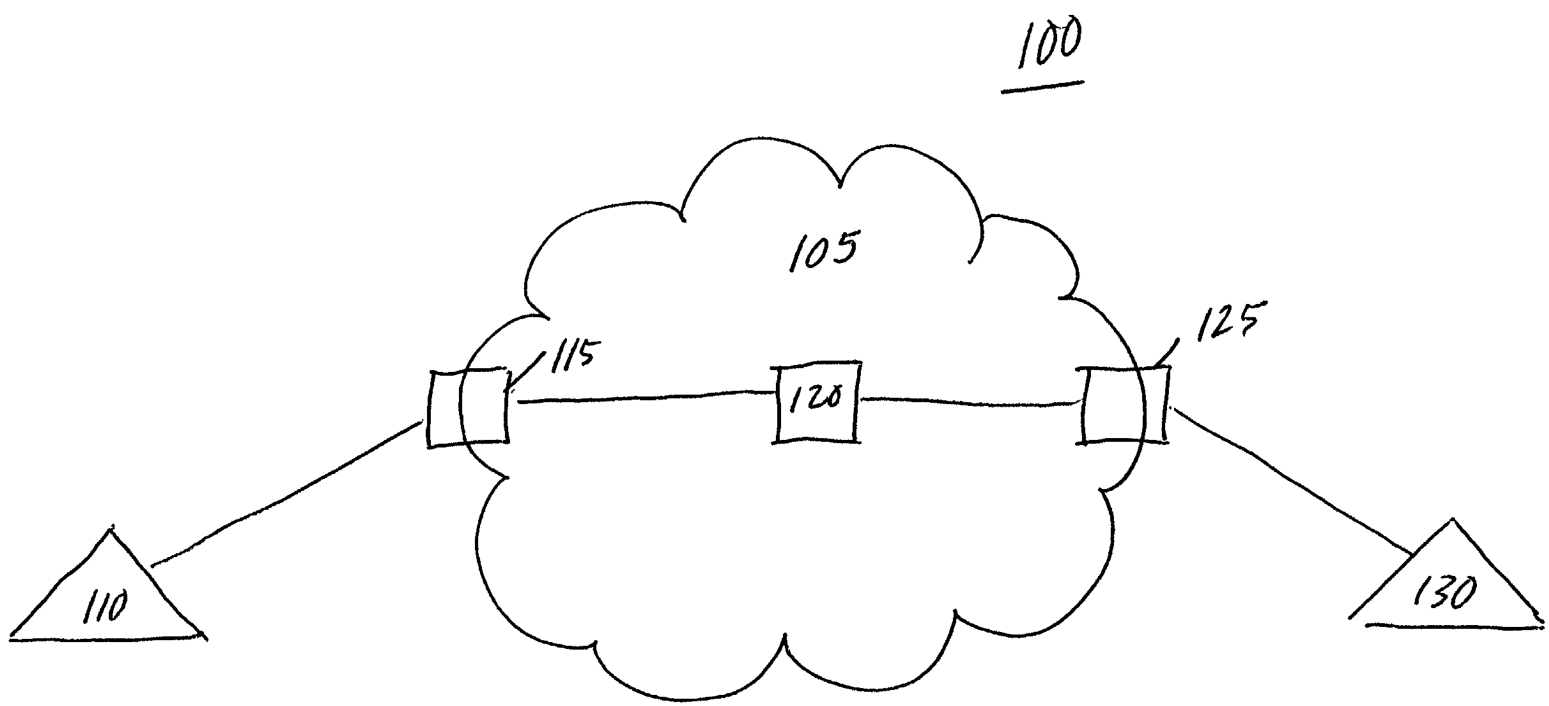
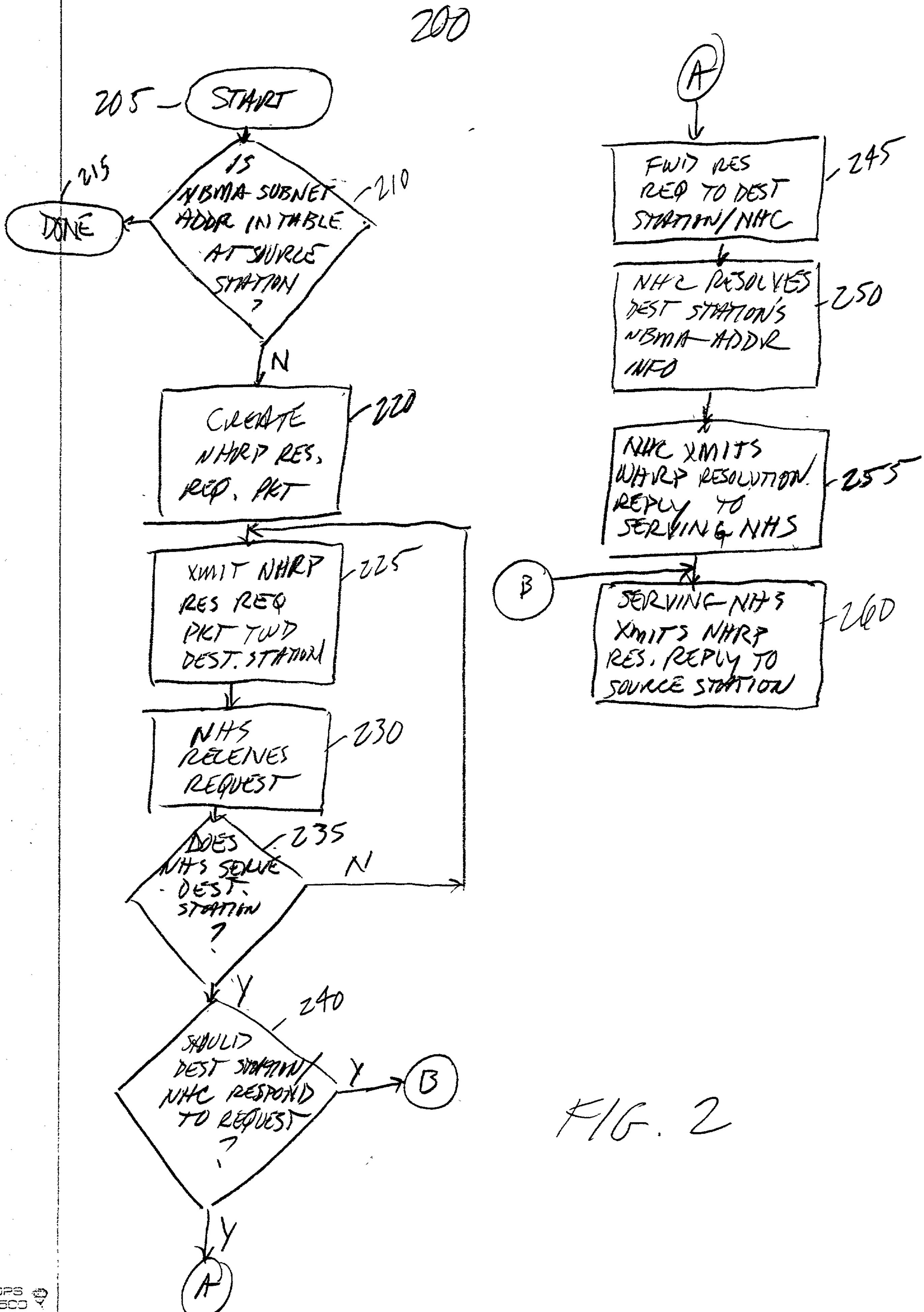


FIG 1 - PRIOR ART



200
205
START
IS NBMA SUBNET ADDR IN TABLE AT SOURCE STATION ?
210
215
DONE
N
CREATE NHRP RES. REQ. PKT
220
XMIT NHRP RES REQ PKT TWD DEST. STATION
225
NHS RECEIVES REQUEST
230
DOES NHS SERVE DEST. STATION ?
235
N
Y
SHOULD DEST STATION/ NHC RESPOND TO REQUEST ?
240
Y
B
Y
A
A
FWD RES REQ TO DEST STATION/NHC
245
NHC RESOLVES DEST STATION'S NBMA ADDR INFO
250
NHC XMITS NHRP RESOLUTION REPLY TO SERVING NHS
255
B
SERVING NHS XMITS NHRP RES. REPLY TO SOURCE STATION
260

FIG. 2

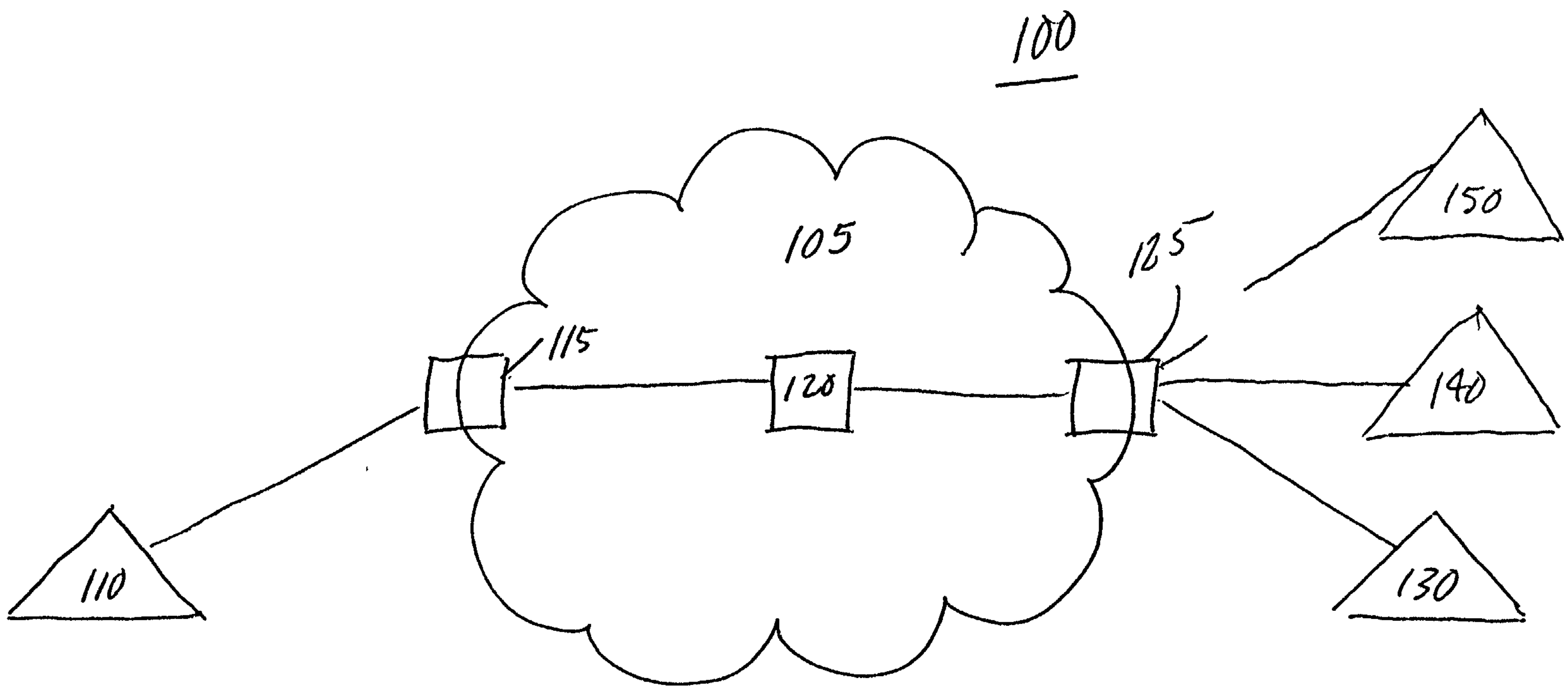


FIG 3

Attorney's Docket No.: 082771.P259

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or any original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

METHOD FOR IMPROVING SIGNALING EFFICIENCY AND PERFORMING SERVICE LOAD BALANCING IN A CONNECTION ORIENTED NETWORK

the specification of which [X] is attached hereto.
[ ] was filed on _____ as
United States Application Number _____
or PCT International Application Number _____
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above. I do not know and do not believe that the claimed invention was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (for a utility patent application) or six months (for a design patent application) prior to this application.

I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d), of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):

APPLICATION NUMBER	COUNTRY (OR INDICATE IF PCT)	DATE OF FILING (day, **month**, year)	PRIORITY CLAIMED UNDER 37 USC 119
			☐ No ☐ Yes
			☐ No ☐ Yes
			☐ No ☐ Yes

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below:

APPLICATION NUMBER	FILING DATE

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

APPLICATION NUMBER	FILING DATE	STATUS (ISSUED, PENDING, ABANDONED)

I hereby appoint BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP, a firm including: William E. Alford, 37,764; Farzad E. Amini, 42,261; Amy M. Armstrong, 42,265; Aloysius T. AuYeung, 35,432; W. Thomas Babbitt, 39,591; Carol F. Barry, 41,600; Jordan M. Becker, 39,602; Bradley J. Bereznak, 33,474; Michael A. Bernadicou, 35,934; Roger W. Blakely, Jr., 25,831; Gregory D. Caldwell, 39,926; Ronald C. Card, 44,587; Thomas M. Coester, 39,637; Michael A. DeSanctis, 39,957; Daniel M. DeVos, 37,813; Robert A. Diehl, 40,992; Matthew C. Fagan, 37,542; Tarek N. Fahmi, 41,402; James Y. Go, 40,621; James A. Henry, 41,064; Willmore F. Holbrow III, 41,845; George W Hoover, 32,992; Eric S. Hyman, 30,139; Dag H. Johansen, 36,172; William W. Kidd, 31,772; Erica W. Kuo, 42,775; Michael J. Mallie, 36,591; Paul A. Mendonsa, 42,879; Darren J. Milliken, 42,004; Thinh V. Nguyen, 42,034; Dennis A. Nicholls, 42,036; Kimberley G. Nobles, 38,255; Lisa A. Norris, P 44,976; Daniel E. Ovanezian, 41,236; Babak Redjaian, 42,096; James H. Salter, 35,668; William W. Schaal, 39,018; James C. Scheller , 31,195; Jeffrey S. Smith, 39,377; Maria E. Sobrino, 31,639; Stanley W. Sokoloff, 25,128; Judith A. Szepesi, 39,393; Vincent P. Tassinari, 42,179; Edwin H. Taylor, 25,129; George G. C. Tseng, 41,355; Joseph A. Twarowski, 42,191; Lester J. Vincent, 31,460; John P. Ward, 40,216; Charles T. J. Weigell, 43,398; Kirk D. Williams, 42,229; James M. Wu, P 45,241; Steven D. Yates, 42,242; Ben J. Yorks, 33,609; Norman Zafman , 26,250; my attorneys; and Amy M. Armstrong, Reg. No. P42,265; Robert Andrew Diehl, Reg. No. P40,992; and Edwin A. Sloane, Reg. No. 34,728; my patent agents, with offices located at 12400 Wilshire Boulevard, 7th Floor, Los Angeles, California 90025, telephone (714) 557-3800, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of Sole/First Inventor (given name, family name) **James V. Luciani**

Inventor's Signature _____ Date 11/6/99

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